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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/820,933	03/30/2001	Hideyo Makino	204398US2	4152

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EXAMINER

PHAM, HAI CHI

ART UNIT	PAPER NUMBER
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2861

DATE MAILED: 07/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/820,933

Applicant(s)

MAKINO, HIDEYO

Examiner

Hai C Pham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). ____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3, 4. 6) ☐ Other: ____

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

~~2.~~

Claim Objections

3. Claims 6 and 22 are objected to because of the following informalities:

Claim 6:

- Line 17, “at least *one of* in a line *or* substantially in a line ...” should read –at least one of in a line **and** substantially in a line ...--.

Claim 22:

- Lines 14-15, “the light beam passing the light collecting element” should read -- the light beam passing **through** the light collecting element --.

Appropriate correction is required.

Duplicate Claims Warning

4. Claims 6-10 are objected to under 37 CFR 1.75 as being a substantial duplicate of claims 1-5. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

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In fact, claim 6 includes all the limitations recited in corresponding claim 1 even the separately recited element "a recording medium" in claim 6 is also included in claim 1. Furthermore, although claim 6 is directed to "an image forming apparatus" while claim 1 recites "a multi-beam scanning device", both devices comprise a multiple light beams emitted by a laser diode array, and perform the exact same function, namely "scan the recording medium" (emphasis added) with the multiple light beams.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. Claims 1, 2, 4-7, 9-12, 14-17, 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. (U.S. 6,366,384 B1) in view of Asada (U.S. 6,222,611 B1).

Aoki et al. discloses a multi-beam scanning apparatus comprising a laser diode array (111) having at least three light emitting points arranged in a package at an equal interval (p, Fig. 6) and configured to emit respective laser beams that form corresponding laser beam spots on a recording medium at a minimum recording interval (L), the equal interval being not greater than the minimum recording interval (col. 9, lines 1-15), and the at least three light emitting points being arranged such that the corresponding laser beam spots on the recording medium are arranged at least one of

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in a line and substantially in a line in a direction orthogonal to the main scanning direction (Figs. 4-8).

However, Aoki et al. is silent in the teaching of the laser beams from the at least three light emitting points scanning the recording medium in a main scanning direction while being at least one of on and off so as to form a light image. Aoki et al. also fails to teach any one of the laser beams being used as a clock laser beam configured to determine a timing of starting each main scanning.

Regardless, it is well known in the art ^{of} printing that the laser source is driven ON and OFF based on the input image data to form a latent image on the surface of the recording medium as it is highlighted by Asada. Asada further teaches each of the laser beams used as a clock laser beam configured to determine a timing of starting each main scanning via the delay time setting devices (Fig. 3).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Aoki et al. with the aforementioned teaching of Asada for the purpose of synchronizing the start of printing time for each of the laser beams.

Aoki et al. further teaches in Example 2 a variation in position of the at least three laser beam spots configured to be arranged substantially in a line being not greater than 21.17 μm , and the equal interval being not greater than 14 μm .

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7. Claims 3, 8, 13, 18, 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. in view of Asada, as applied to claims 1, 6, 11, 16 above, and further in view of Nakayama (JP 5-6077).

Aoki et al. in view of Asada discloses all the basic limitations of the claimed invention except for the abnormal lighting detector, and the laser beam changer configured to change the clock laser beam to any one of the laser beams in case of detected abnormality.

However, Nakayama discloses an image forming device using plural light sources, and a detecting device (29) for detecting an abnormality in the emitting state of the light sources (25) such that only normal light sources are used for forming image.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Aoki et al., as modified by Asada, with the aforementioned teaching of Nakayama for the purpose of adjusting the scan timing of each of the laser beams.

8. Claim 21, 23, 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Makino (U.S. 6,320,647 B1) in view of Asada.

Makino discloses a multi-beam scanning device comprising a light beam emitting array (semiconductor array 30, Fig. 3) comprising three or more light emitting elements (101-104), which are arranged at predetermined locations and which emit respective laser beams to form corresponding laser beam spots on a recording medium at a minimum recording interval (pitch P', Fig. 4B), the three or more light emitting elements

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being arranged such that the corresponding laser beam spots on the recording medium are arranged in a line (Fig. 4B) or substantially in a line in a direction orthogonal to the main scanning direction (Fig. 4A).

However, Makino is silent in the teaching of the laser beams from the at least three light emitting points scanning the recording medium in a main scanning direction while being at least one of on and off so as to form a light image.

Regardless, it is well known in the art of printing that the laser source is driven ON and OFF based on the input image data to form a latent image on the surface of the recording medium as it is highlighted by Asada.

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Makino with the aforementioned teaching of Asada for the purpose of synchronizing the start of printing time for each of the laser beams.

Makino further discloses a light collecting element (collimator lens 35, Fig. 3) being at least approximately arranged such that the optical axis (A) of the light collecting element passes at least approximately through the symmetrical center of the arranged of the light emitting elements, and the light beam array and the light collecting element are part of a subunit (3), which is securable to a support unit (base 10 and printer housing 12) for supporting the subunit such that a relative angle of rotation around the optical axis between the subunit and the support unit is adjustable (Fig. 5).

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9. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. in view of Asada, as applied to claim 21 above, and further in view of Ito (U.S. 5,471,236).

Aoki et al. in view of Asada discloses all the basic limitations of the claimed invention including the relationship:

$$p = L / |\beta|$$

where p is interval between light emitting points of the laser diode array,

L is the scanning line pitch,

β is the lateral magnification of the multi-beam scanning device,

but fails to teach the claimed relationship, which involves the focal distances of the collimator lens and the beam-shaping lens, respectively.

However, it is well known in the art of printing that the overall lateral magnification (m) of an optical scanning device is defined as a product of the lateral magnification of the pre-deflection optical system (m_1) (comprising a collimator lens and a condenser lens) and that of the post-deflection optical system (m_2) (including the imaging lenses) as exemplified by Ito:

$$m = m_1 \cdot m_2 = (f_2/f_1) \cdot m_2$$

where, f_1 is the focal distance of the collimator lens, and

f_2 is the focal distance of the cylindrical lens.

Therefore,

$$p = L / m$$

$$= L / [(f_2/f_1) \cdot m_2]$$

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$$= (f_1/f_2) \cdot (L/m_2)$$

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to incorporate the above teaching of Ito into the calculation of the scanning pitch in the device of Aoki et al., as modified by Asada since it is known in the art that such determination of the scanning pitch would include the characteristics of the pre-deflection optical system.

10. Claim 25 is rejected under 35 U.S.C. 103(a) as being unpatentable over Aoki et al. in view of Asada, as applied to claim 21 above, and further in view of Komatsu (U.S. 5,774,248).

Aoki et al. in view of Asada discloses all the basic limitations of the claimed invention except for the centers of the light beam spots on the recording medium deviating less than 1/2 from a target distance between centers of the light beam spots and a line in the main scanning direction.

However, Komatsu discloses a multi-beam scanning apparatus in which the laser diode array with a plurality of light emitting points arranged at equal intervals is adjusted such that the position deviation of the vertical line connecting the centers of the light beam spots in the sub-scanning direction is corrected, the position deviation being less than 1/2 from a target distance between centers of the light beam spots and a line in the main scanning direction (Fig. 11).

It would have been obvious at the time the invention was made to a person having ordinary skill in the art to modify the device of Aoki et al., as modified by Asada,

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with the aforementioned teaching of Komatsu. By doing so, it is possible to correctly align the light beams in a vertical line in the sub-scanning direction as a starting point.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hai C Pham whose telephone number is (703) 308-1281. The examiner can normally be reached on T-F (8:30-5:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John S. Hilten can be reached on (703) 308-0719. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7722, (703) 308-7724, (703) 308-7382, (703) 305-3431, (703) 305-3432 for regular communications and for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



HAI PHAM
PRIMARY EXAMINER

July 13, 2002